

Appendix L

Attainment Test

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I. ATTAINMENT DEMONSTRATION

This Appendix summarizes the procedures that were used to demonstrate attainment of the 8-hour ozone National Ambient Air Quality Standard (NAAQS) in this State Implementation Plan (SIP) package. As described in the US Environmental Protection Agency's (USEPA's) September 2006 draft final Guidance On The Use Of Models And Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, PM_{2.5}, and Regional Haze ("*Attainment Guidance*"), an attainment demonstration consists of (a) analyses which estimate whether selected emissions reductions will result in ambient concentrations that meet the NAAQS, and (b) an identified set of control measures which will result in the required emissions reductions. The necessary emission reductions for both of these attainment demonstration components may be determined by relying on results obtained with air quality models.

Section 3.0 of the *Attainment Guidance* recommends applying both a modeled attainment test and a subsequent screening test to the air quality modeling results to determine if the 8-hour ozone NAAQS will be met. Additional technical or corroboratory analyses may also be used as part of a "weight of evidence" determination to supplement the modeled attainment test and to further support a demonstration of attainment of the NAAQS.

The modeled attainment test, additional corroborative analyses and weight of evidence, and unmonitored area analysis are described in further detail in the remaining portions of this Appendix, detailing how the respective test or analysis was performed and applied to the attainment demonstration.

II. MODELED ATTAINMENT TEST

The modeled attainment test is the practice of using an air quality model to simulate baseline (i.e., current) and future air quality. For the 8-hour ozone NAAQS, the baseline and future model estimates are used in a “relative” rather than “absolute” sense. Specifically, the ratio of the air quality model’s future to baseline predictions is calculated at each ozone monitoring site. These monitoring site-specific ratios are called relative response factors (RRF). Future ozone design values (DVF) are then estimated at each monitor by multiplying the monitor-specific baseline ozone design value (DVB) by the modeled relative response factor for each monitor. If the resulting predicted site-specific DVFs are < 82 parts per billion (ppb), a clear demonstration of predicted attainment is shown. If the predicted DVFs is ≥ 82 ppb and ≤ 87 ppb, then a weight of evidence demonstration must be submitted that supports a demonstration of attainment. For DVFs > 87ppb, the *Attainment Guidance* states that more qualitative results are less likely to support a conclusion differing from the outcome of the modeled attainment test. Equation L-1 presents the modeled attainment test, applied at monitoring site “x” as described in Section 4.0 of the *Attainment Guidance*.

$$(\text{DVF}) = (\text{RRF}) \times (\text{DVB}) \quad \text{Equation L-1}$$

Where (DVB) = the baseline design value monitored at site "x", ppb
= the average (of the three) design value periods which include the baseline inventory year (i.e., the average of the 2000-2002, 2001-2003, and 2002-2004 design values periods for the 2002 baseline inventory year).

(RRF) = the ratio of the future 8-hr daily maximum concentration predicted "nearby" a monitor (averaged over each day of the episode) to the current 8-hr daily maximum concentration predicted "nearby" the monitor (averaged over each day of the episode).

(DVF) = the estimated future design value, ppb.

It is important to consider an array of cells “nearby” a monitor rather than focusing on the individual cell containing the monitor. This allows for variations in the model performance where the peak ozone may not occur in the grid cell that contains the monitor but rather nearby the monitor. Table L-1 provides the USEPA’s recommendations for defining “nearby” cells for grid systems having cells of various sizes. Since the attainment demonstration modeling was performed using a 12-kilometer grid resolution, the size of the array for “nearby” cells was 3 x 3.

Table L-1: USEPA’s Recommendation for Defining “Nearby” Cells

Size of Cell (km)	Size of the Array of “Nearby” Cells
≤ 5	7 x 7
>5-8	5 x 5
>8-15	3 x 3
>15	1 x 1

The RRF is calculated by taking the ratio of the mean future year modeling 8-hour ozone daily maximum to the mean baseline year modeling 8-hour ozone daily maximum “near” the monitor. (Equation L-2).

$$\text{RRF} = \frac{\text{mean future yr. 8-hr daily max "near" monitor "x"}}{\text{mean baseline yr. 8-hr daily max "near" monitor "x"}} \quad \text{Equation L-2}$$

Section 14.1.1 of USEPA's *Attainment Guidance* outlines the process for determining which days are used in the RRF calculation. The day selection process starts by identifying all the days in the baseline modeling that has a modeled daily maximum 8-hour average ozone equal to or greater than 85 ppb. If there are 10 or more days greater than 85 ppb, then 85 ppb is used as the cutoff with those days used in the RRF calculation. If there are fewer than 10 days with a modeled daily maximum 8-hour average ozone equal to or greater than 85 ppb, then the threshold is reduced by 1 ppb until there are at least 10 days identified for use. If there are fewer than 10 days with a modeled daily maximum 8-hour average ozone equal to greater than 70 ppb, then all days at 70 ppb and higher are used in the RRF calculation and consideration of modeling another episode should be explored.

The DVB, for purposes of the modeled attainment test, is defined in the *Attainment Guidance* by one of four methods:

1. The design value period (e.g., the average 4th highest value for the 3-yr period used to designate an area "nonattainment", here the period from 2001 to 2003)
2. The average 4th highest value for the 3-yr period straddling the baseline inventory year (e.g., the 2001-2003 design value period for the 2002 baseline inventory year)
3. The highest of the three design value periods which include the baseline inventory year (e.g., the 2000-2002, 2001-2003, 2002-2004 design value periods for a 2002 baseline inventory year)
4. The average of the three design value periods which straddle the baseline inventory year (e.g., the average of the 2000-2002, 2001-2003, and 2002-2004 design value periods for a 2002 baseline inventory year)

The USEPA recommends the fourth method (average of the three design value periods straddling the baseline year), which is the DVB shown in Table L-2 at each ozone monitoring site in the Metrolina region.

Table L-2 lists the attainment test results by monitor in the Metrolina area. The first column is the monitoring site, then the county the monitor is located in, followed by the DVB used for the test. The next series of columns are the number of days used in the calculation, the ozone level threshold needed to reach at least 10 days for RRF, the calculated RRF and the resulting DVF for the attainment year, 2009. The bold italicized DVFs are values that fall within the range where additional weight of evidence is needed to demonstrate attainment. Half of the monitors in the Metrolina nonattainment area have predicted DVFs that fall below 82 ppb and the other half fall between 82 ppb and 87 ppb. Therefore, additional weight of evidence is required to demonstrate attainment. The North Carolina Division of Air Quality (NCDAQ) and the South Carolina Department of Health and Environmental Control (SCDHEC) believe that the weight of evidence presented in Section III supports a demonstration of attainment.

Table L-2: Metrolina Attainment Test Results for 2009

Monitoring Site	County	DVB (ppb)	Number of Days used in RRF	Ozone Threshold (ppb)	RRF	DVF (ppb)
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Arrowood	Mecklenburg	84.7	18	85	0.892	75
County Line	Mecklenburg	97.3	13	85	0.874	85
Crouse	Lincoln	90.7	10	84	0.868	78
Enochville	Rowan	97.0	13	85	0.870	84
Garinger (Plaza)	Mecklenburg	95.3	19	85	0.883	84
Monroe	Union	87.0	10	81	0.884	76
Rockwell	Rowan	97.3	10	84	0.862	83
York	York, SC	83.0	11	84	0.861	71

II. ADDITIONAL CORROBORATIVE ANALYSES AND WEIGHT OF EVIDENCE DETERMINATION

As part of the weight of evidence determination, the following analyses will be evaluated:

- Alternative DVF calculations,
- Metrics of air quality modeling results,
- Air quality modeling results from other studies,
- Observed air quality trends and additional reductions in emissions, and
- Local measures not modeled.

The weight of evidence determination is a supplement to the modeled attainment test and further supports that the area will attain the NAAQS for 8-hour ozone by June 15, 2010.

A. Alternative DVF Calculation

The NCDAQ/SCDHEC used the USEPA recommended method of calculating the DVB in its modeled attainment test. However, the NCDAQ has commented several times on various draft versions of the attainment guidance that it does not believe that a weighted DVB is appropriate and that a DVB calculated using a straight average minimizes the impacts of any abnormally hot/dry or cool/wet meteorological conditions. As part of the weight of evidence demonstration, the NCDAQ/SCDHEC propose an alternative method to calculate the DVB and presents the modeled attainment test results with this alternative DVB.

The USEPA recommends calculating the DVB by averaging the three design value periods that straddle the baseline inventory year. This methodology results in a center weighting of annual 4th highest ozone concentrations around the baseline inventory year because the three design value periods averaged contain overlapping data. When simplified, the recommended DVB calculation for this SIP modeling exercise can be seen in Equation L-3.

$$\text{DVB} = \frac{1*(2000 \text{ 4}^{\text{th}} \text{ Highest}) + 2*(2001 \text{ 4}^{\text{th}} \text{ Highest}) + 3*(2002 \text{ 4}^{\text{th}} \text{ Highest}) + 2*(2003 \text{ 4}^{\text{th}} \text{ Highest}) + 1*(2004 \text{ 4}^{\text{th}} \text{ Highest})}{9}$$

Equation L-3

The weighting scheme of annual 4th highest ozone concentrations in the recommended DVB calculation weights the center, or third, year three times more than that of the first or last year and one and a half times more than that of the second or fourth year. If this third year is an abnormally hot/dry or cool/wet period, the unusual meteorological conditions and resulting air quality conditions will be amplified upward or downward in the modeled attainment exercise.

To minimize potential impacts of any abnormal meteorological conditions while still considering ozone conditions across a 5-year span, an alternative DVB calculation--that does not weigh any of the years more than another but is a straight average of annual 4th highest ozone concentrations for the 5-year span centered on the baseline inventory year--was considered (Equation L-4).

$$\text{DVB} = \frac{2000 \text{ 4}^{\text{th}} \text{ Highest} + 2001 \text{ 4}^{\text{th}} \text{ Highest} + 2002 \text{ 4}^{\text{th}} \text{ Highest} + 2003 \text{ 4}^{\text{th}} \text{ Highest} + 2004 \text{ 4}^{\text{th}} \text{ Highest}}{5} \quad \text{Equation L-4}$$

When the five-year straight average DVB is applied to the remainder of the Modeled Attainment Test equations, the resulting DVFs are shown in Table L-3 at each monitoring site in the Metrolina region.

Table L-3: Five-Year Average Alternative Attainment Test Results for 2009

Monitoring Site	County	DVB 5-Year Straight Average 2000-2004 (ppb)	RRF	DVF (ppb)
Arrowood	Mecklenburg	83.4	0.892	74
County Line	Mecklenburg	95.6	0.874	83
Crouse	Lincoln	89.2	0.868	77
Enochville	Rowan	94.4	0.870	82
Garinger (Plaza)	Mecklenburg	93.8	0.883	82
Monroe	Union	84.6	0.884	74
Rockwell	Rowan	94.6	0.862	81
York	York, SC	79.8	0.861	68

In comparison to the respective DVF values found in Table L-2, the DVF values in Table L-3 are slightly lower at each monitoring site. These differences were expected, as 2002 was an abnormally hot and dry year throughout the Southeast resulting in ozone concentrations that were higher than in the surrounding years of 2000, 2001, 2003, and 2004. Figure L-1 below illustrates this by charting the number of days with temperatures greater than 90° F versus the maximum fourth highest 8-hour ozone value for the Metrolina area. Comparing 2002 to the surrounding years used in the DVB (2000, 2001, 2003, and 2004), 2002 had significantly more days with greater than 90°F temperatures. Similarly, the maximum fourth highest 8-hour ozone value was ~5 ppb higher than the surrounding years used in the DVB.

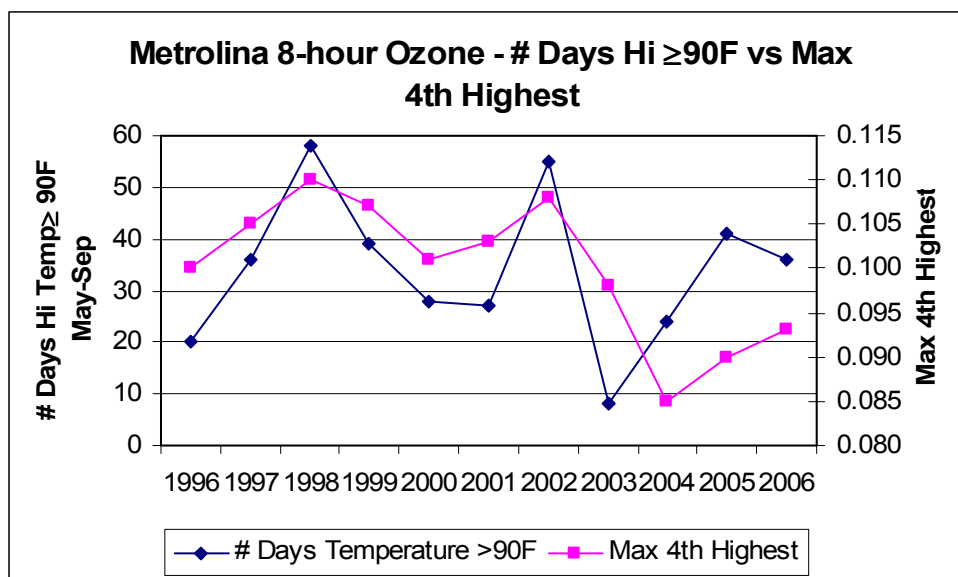


Figure L-1: Number of days greater than 90°F versus the 4th highest 8-hour ozone value for the Metrolina area.

Thus, the recommended DVB calculation weighted the higher air quality conditions several times more than in the NCDAQ alternative DVB calculations. The NCDAQ firmly believes that the non-weighted or straight five-year average approach to the DVB calculation is more appropriate and minimizes dramatic fluctuations in meteorological and air quality conditions from year to year. This would be the case whether the center weighted year was an abnormally hot/dry year or a cool/wet year.

While none of the monitoring sites in the Metrolina region had DVF values at or above 85 ppb in Table L-3 using the NCDAQ alternative DVB calculation, there are still three monitors that have DVFs that fall between 82 ppb and 87 ppb. This continues to indicate that some additional weight of evidence should still be included to demonstrate attainment. These results are not inconsistent with what was concluded using all recommended modeled attainment test calculations.

B. Air Quality Modeling Metrics

In Section 7.0 of the *Attainment Guidance*, various aspects of air quality models, modeled performance, and uncertainties associated with the length of modeled episodes and limited observational datasets are described. A series of three additional air quality modeling outputs or metrics is recommended to provide assurance the modeled attainment demonstration indicates attainment. These metrics look at the relative change between the baseline and future years modeling and help to demonstrate how widespread the improvement in air quality is expected in the future. Although the final guidance did not recommend percentage cut points that corresponds to supportive weight of evidence, an earlier draft version of the *Attainment Guidance* recommends that the metrics should be at least 80% or higher.

As described in Section 7.1 of the *Attainment Guidance*, the collected modeling data from the 2002 and 2009 modeling output masks were applied to the following metrics:

1. Relative change in surface grid-hours greater than 84 ppb. This metric is termed Persistence-Hour and is defined as the number of grid-cells in a given region with predicted hourly 8-hour ozone concentrations greater than 84 ppb. The relative change in Persistence-Hour is presented as a percent reduction computed for the modeling period May through September from the baseline year case to the future year case.
2. Relative change in the number of grid cells with predicted 8-hr daily maxima greater than 84 ppb. This metric is termed Persistence-Daily metric and is similar to Persistence-Hr, but uses the modeled daily maximum 8-hour ozone concentrations greater than 84 ppb instead of the hourly 8-hour ozone concentrations. The relative change in Persistence-Daily is also presented as a percent reduction computed for the modeling period May through September from the baseline year case to the future year case.
3. Relative change in the sum of hourly predictions greater than 84 ppb. This metric is termed Severity-Hour and is defined as the sum of all grid-cells with predicted hourly 8-hour ozone concentrations greater than 84 ppb. Given the definition of Persistence, this Severity could be considered as a weighted form of the Persistence metric. The relative change in Severity is also presented as a percent reduction computed for the modeling period May through September from the baseline year case to the future year case.

In addition to the three recommended metrics, two additional metrics were computed to create a comprehensive corroborative analysis. The two additional metrics are:

4. Relative change in the sum of the predicted 8-hr daily maxima greater than 84 ppb. Severity-Daily metric is similar to Severity-Hour, but uses the modeled daily maximum 8-hour ozone concentrations greater than 84 ppb instead of the hourly 8-hour ozone concentrations. The relative change in Severity-Daily is also presented as a percent reduction computed for the modeling period May through September from the baseline year case to the future year case.
5. Air Quality Index (AQI) counts. The AQI Counts metric is a count of the number of grid-cells with predicted maximum 8-hour ozone concentrations sorted within each of the Code Green, Yellow, Orange and Red categories, as defined by the USEPA's AQI Index. As with the persistence and severity metrics, the AQI counts metric can be applied to both hourly and daily maximum 8-hour ozone concentrations. AQI Counts are presented as percentages of the total number of grid-cells within the study region.

The metrics described above were applied to the modeling results for just of the nonattainment area. Below, Figure L-2 depicts the region for which this modeling data was extracted for both the 2002 baseline and the 2009 attainment year modeling runs.

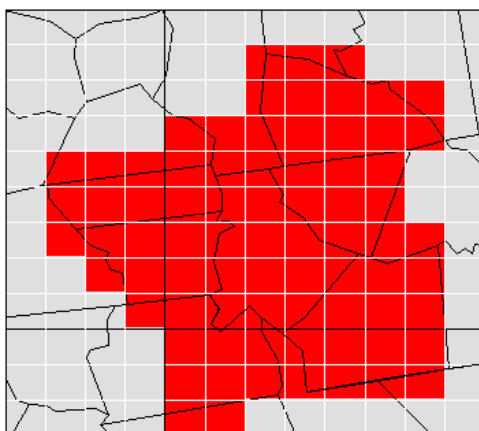


Figure L-2: Area for which the air quality metrics were applied.

The results from each of the five air quality modeling metric calculations demonstrated significant reductions of greater than 85% in the 2009 future year air quality modeling for days that modeled above the NAAQS in the Metrolina nonattainment area. Each metric demonstrated very large relative reductions for 2009. It is important to note that the relative reductions in all metrics well surpassed the draft version of the *Attainment Guidance* recommendation of 80% for these particular calculations.

Figure L-3 below presents the relative reductions calculated in the first four metrics described above. The left 2 bars are the Persistence-Hour and Persistence-Daily reductions, and the right 2 bars are the Severity-Hour and Severity-Daily reductions. The results demonstrate a 91.2% reduction in persistence of hourly maximum ozone and 88.7% reduction in persistence of daily maximum ozone. The severity reductions are on a similar scale of 91.6% and 89.1% reduction for hourly and daily maximum ozone, respectively.

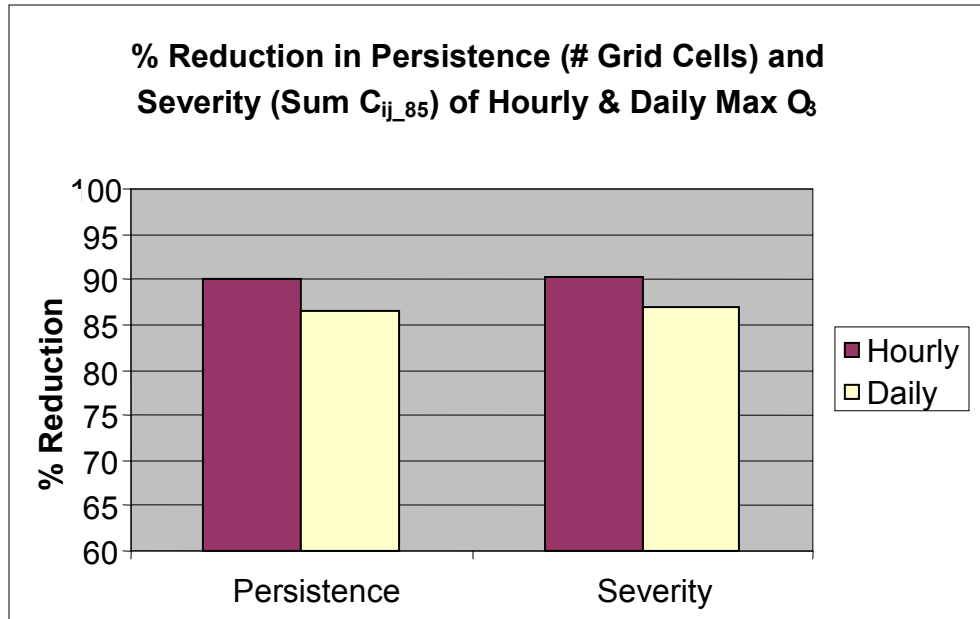


Figure L-3: Persistence and Severity for the Metrolina Area

Equating the 89.1% relative reduction in the daily maximum ozone to AQI counts, Figure L-4 demonstrates a drop from 257 grid cells in the Code Orange and Red levels in the 2002 baseline modeling to only 29 grid cells in the 2009 future modeling. Furthermore, the number of grid cells in the Code Yellow and above (>65 ppb) is reduced by over half, from 3,352 grid cells in 2002 to 1,536 grid cells in 2009.

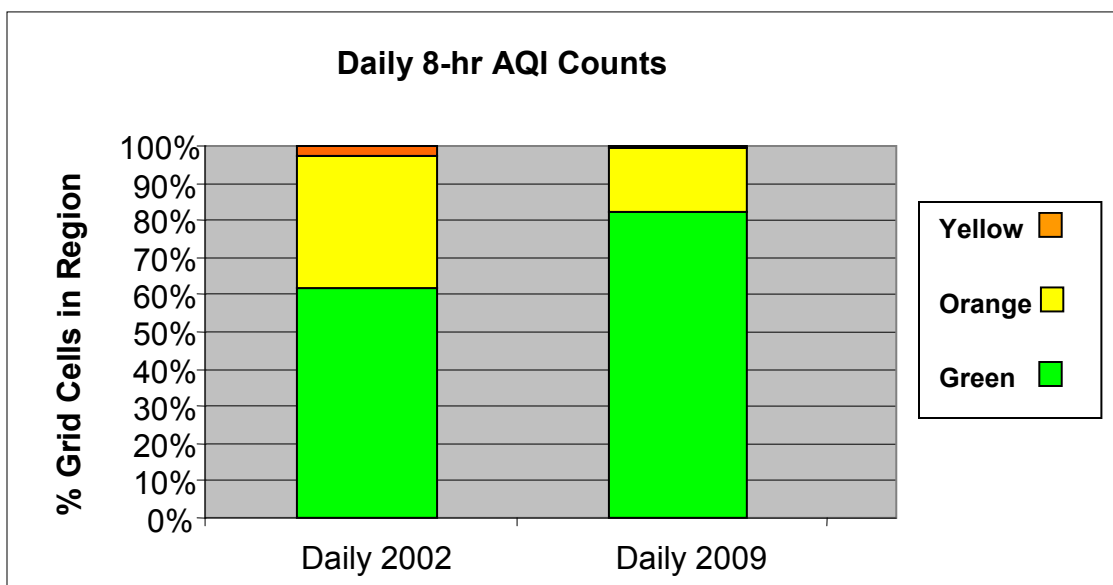


Figure L-4: Daily AQI counts for the Metrolina Area

The hourly AQI counts are equally encouraging. Figure L-5 displays the 91.2% relative reduction in hourly persistence in terms of the AQI counts. It corresponds to a reduction from 988 hourly grid cells in the Code Orange and Red levels in the baseline modeling to only 86 hourly grid cells in the attainment year modeling. Looking at all hourly grid cells Yellow and above, the count is reduced from 25,890 hourly grid cells to 9,140, which translates to a 64.7% reduction. Table L-4 contains all the grid cell counts for both the Hourly and Daily AQI count analysis.

Figure L-5: Hourly AQI Count for the Metrolina Area

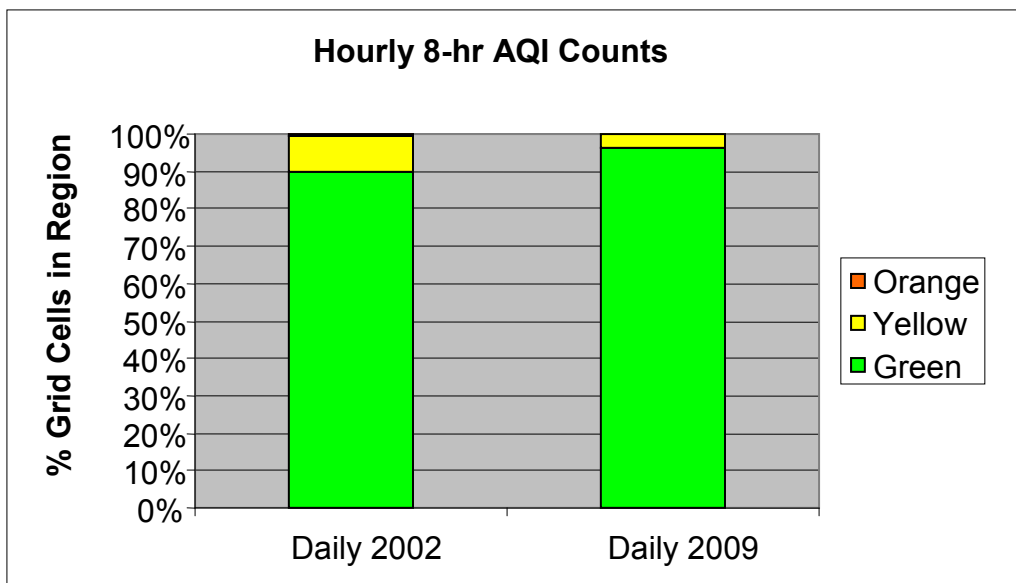


Table L-4: Total number of grid cells for the AQI Categories.

	Grid Cells		Grid Cells	
	Daily 2002	Daily 2009	Hourly 2002	Hourly 2009
Green	7181	9543	250856	268576
Yellow	4107	2039	26900	10365
Orange	340	46	1316	131
total	11628	11628	279072	279072

C. Air Quality Modeling Results From Other Studies

Another recommended weight of evidence analysis is to review other air quality modeling results that included the Metrolina nonattainment area to determine how other modeling results compare to the attainment demonstration. There are two air quality modeling studies to which results are available for the Metrolina area.

The first is the Early Action Compact (EAC) modeling that the NCDAQ performed for the EAC areas within North Carolina. Since the modeling domain for this analysis covered the majority of North Carolina, including the Metrolina nonattainment area, the modeling results can be easily compared to the

attainment demonstration. There are some differences between the two modeling exercises. One difference is that the EAC modeling was carried out on 4 episodes (one in 1995, two in 1996 and one in 1997) for a total of sixteen days. Another is the DVB is based on the higher of the 1999-2001 or 2001-2003 design values. Finally, the EAC modeling did not model 2009, but there are results for 2007 and 2012. Table L-5 displays the EAC modeling results for the Metrolina monitors for both of these future years.

Table L-5: Metrolina DVFs based on EAC Modeling

Monitoring Site	County	DVB (ppb)	2007		2012	
			RRF	DVF (ppb)	RRF	DVF (ppb)
Arrowood	Mecklenburg	092	0.891	82	0.848	78
County Line	Mecklenburg	101	0.861	87	0.802	81
Crouse	Lincoln	92	0.870	80	0.826	76
Enochville	Rowan	99	0.879	87	0.818	81
Garinger (Plaza)	Mecklenburg	98	0.888	87	0.816	80
Monroe	Union	88	0.852	75	0.795	70
Rockwell	Rowan	100	0.870	87	0.800	80

As can be seen from the EAC modeling, although there are still four monitors slightly above the 8-hour ozone standard in 2007, all of the monitors are well below the standard by 2012. It should be noted that for the Greensboro/Winston-Salem/High Point EAC area, the EAC attainment test results predicted the highest monitor in the area to be at 83 ppb in 2007. However the current 2004-2006 design value for that area is 80 ppb, below what was projected and a year earlier.

Another air quality modeling exercise that contained results for the Metrolina nonattainment area is the USEPA's modeling for the Clean Air Interstate Rule (CAIR). The Technical Support Document for the final CAIR (March 2005) provided modeling results with and without the implementation for the CAIR. Differences between the USEPA's modeling and the attainment demonstration are: (1) the meteorology was for 2001, (2) the DVB was the weighted design values the 1999-2003 period, and (3) the modeling results were for 2010. These modeling results are listed in the table below.

Table L-6: Metrolina DVFs based on the USEPA's CAIR Modeling

County	DVB (ppb)	DVF (ppb)	
		2010 Base	2010 CAIR
Lincoln	92.3	76.1	74.5
Mecklenburg	100.3	82.5	81.4
Rowan	99.7	81.3	80.1
Union	87.7	71.9	71.1
York, SC	83.3	70.0	68.5

The USEPA's results were for the highest monitor in a county where more than one monitor is located. The USEPA's modeling results predicts that the Metrolina nonattainment area should be below the 8-hour ozone standard by 2010. Although this is one year later than the attainment year for the Metrolina area, the USEPA's 2010 CAIR DVFs are 3 to 4 ppb lower than what the NCDAQ/SCDHEC

are showing in the attainment demonstration, and supports weight of evidence that the Metrolina area will attain the 8-hour ozone standard by its attainment year of 2009.

D. Air Quality Trends and Additional Reductions in Emissions

Since the 8-hour ozone designation for the Metrolina area, the 8-hour ozone design values have improved significantly. The 2001-2003 design value period had values as high as 100 ppb and six out of the seven North Carolina monitors in the area were violating the NAAQS. Each year since, the design values have decreased and/or the number of violating monitors in the region has decreased. With the latest design value period, 2004-2006, the highest violating monitor has a value of 88 ppb and there are only three monitors that exceed the NAAQS (See Table L-7)

Table L-7: Design Values (ppb) for the North Carolina Monitors in the Metrolina Area

Monitoring Site	County	2001-2003	2002-2004	2003-2005	2004-2006
Arrowood	Mecklenburg	84	81	78	80
County Line	Mecklenburg	98	92	87	88
Crouse	Lincoln	92	86	81	79
Enochville	Rowan	99	91	85	85
Garinger (Plaza)	Mecklenburg	96	91	86	88
Monroe	Union	88	85	79	78
Rockwell	Rowan	100	94	88	83
York	York, SC	84	81	75	76

The current ozone design values are very close to the predicted attainment year design values; however, there are still significant nitrogen oxides (NO_x) emission reductions that are expected between now and the attainment year 2009. Although most of these expected NO_x emission reductions have been included in the attainment demonstration modeling, it does not appear the model is responsive enough to expected emission reductions.

The NCDAQ/SCDHEC have estimated that there will be approximately 8.5 tons per day of NO_x emissions reduced each year from the mobile sector. These reductions are the result of Federal motor vehicle and equipment standards for both highway vehicles and off-road equipment. As the older vehicles in the fleet are retired and replaced with newer vehicles meeting the Federal standards, the NO_x emissions continue to decrease, even though vehicle miles traveled continue to increase. Similarly, as newer off-road equipment is purchased and older equipment is retired, the NO_x emissions see a downward trend.

Another source of NO_x emission reductions that are expected to occur between now and the attainment year are from the electric generating facilities located in and near the Metrolina nonattainment area. The Clean Smokestacks Act requires the two large North Carolina utilities to meet annual NO_x emission budgets for 2007 and a tighter budget for 2009. Several of the Duke Energy units are still expected to have controls installed over the next two years. Figure L-6 displays the location and size of the Duke Energy facilities located in the vicinity of the Metrolina nonattainment area. Table L-8 lists the units that are near the Metrolina area and shows both the year the controls are expected to come on-line and the estimated amount of NO_x emission reductions for the ozone season.

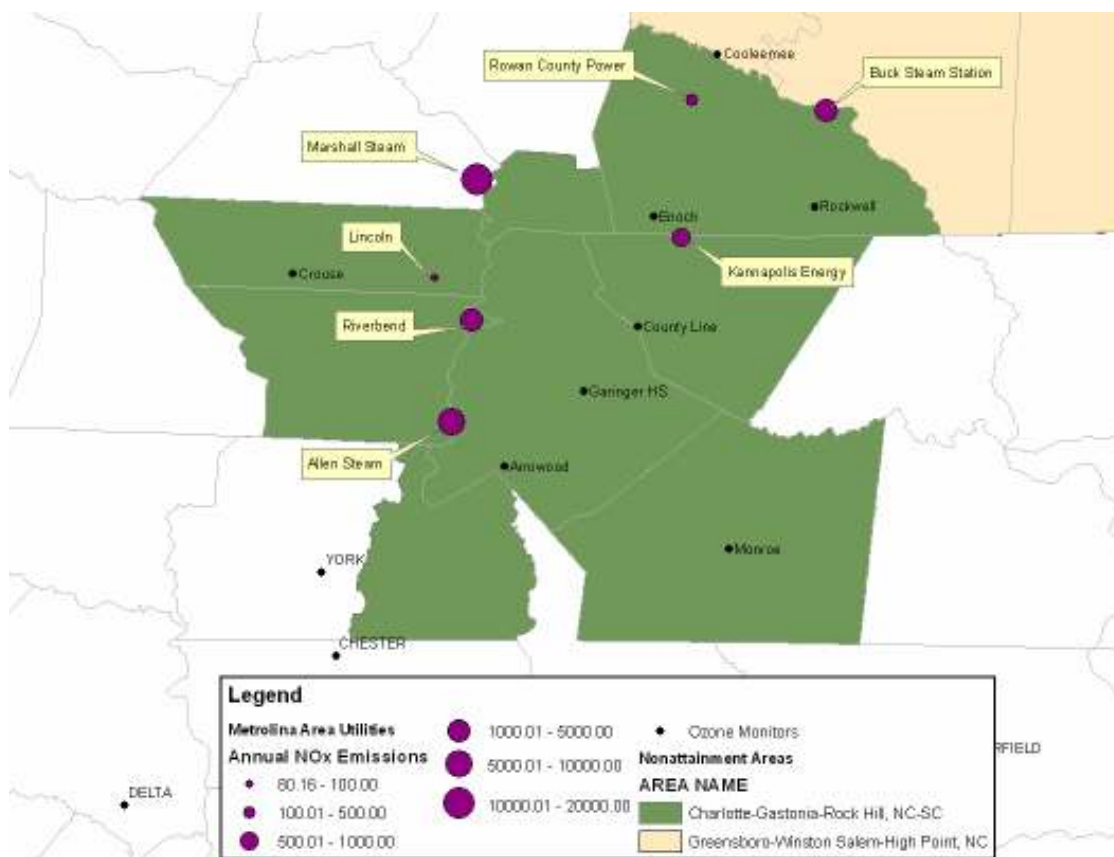


Figure L-6: Location and size of the Duke Energy facilities located in the vicinity of the Metrolina nonattainment area.

Table L-8: Utility NO_x Emission Reductions since 2006 Ozone Season

Facility	County	Technology	Operational Date	Ozone Season Reductions (tons/season)
Allen Steam Station Unit 2 Unit 3	Gaston	SNCR SNCR	Spring 2007 Fall 2007	~300
Buck Steam Station Units 3 & 4 Units 5 & 6	Rowan	Low NO _x Burners SNCR	Spring 2007 Fall 2006	~350
Riverbend Unit 4 Unit 5 Unit 6 Unit 7	Gaston	SNCR SNCR & Burners SNCR & Burners SNCR	Spring 2007 Spring 2007 Fall 2006 Fall 2006	~325
Marshall Steam Station Unit 2 Unit 3 Unit 4	Catawba	SNCR SCR SNCR	Spring 2007 Fall 2008 Fall 2006	~2,300
Total expected reduction = 3,275 tons/ozone season				

SNCR = Selective Non-Catalytic Reduction

SCR = Selective Catalytic Reduction

The combination of the mobile source and utility NO_x emission reductions that are expected in the Metrolina area between the end of the 2006 ozone season and before the beginning of the attainment year 2009 is significant. Since the 2004-2006 design values are just above the standard, the additional NO_x emission reductions in the area should ensure that the Metrolina area would attain the NAAQS by the prescribed attainment year.

E. Local Measures not Modeled

As discussed in Section III of the Attainment Demonstration narrative, the Metrolina nonattainment area is a NO_x-limited area, and the largest source of NO_x emissions in this region come from mobile sources and electric generating facilities. A significant source of NO_x emission reductions that has not been included in the modeling is the addition of an SCR unit at Marshall Unit 3. When the modeling was started, Duke Energy had installed an SNCR unit at Marshall Unit 3. However, since the expected 2009 Duke Energy system-wide NO_x emissions is very close to the Clean Smokestack Act annual budget for this company, Duke Energy has announced its intent to install an SCR unit in order to provide a safety margin in meeting the Clean Smokestack Act NO_x budget. As can be seen in Figure L-6 in the previous section, the Marshall Steam Station is located directly north and adjacent to the Metrolina nonattainment area. The additional NO_x emission reductions expected at this facility will have an impact on the ozone formation in the Metrolina area on days when the winds are coming from the north/northwest and on days when there is recirculation occurring. This SCR unit should be installed the Fall of 2008 and will be operational before the beginning of 2009. A copy of the 2007 compliance plan for Duke Energy documenting this planned installation of the SCR at Marshall Unit 3 can be found in Appendix M.

In addition to the Marshall NO_x emission reductions, the Metrolina area has a number of groups that work towards decreasing emissions. These measures are voluntary measures that although may not

account for large emission reductions, they are directionally correct. A few of the known measures that are under way in the Metrolina area are listed below. A list of known projects going on in North Carolina is attached at the end of this Appendix.

- I-77 High Occupancy Vehicle (HOV) lane in Mecklenburg County. A recent evaluation of the HOV lanes on I-77 through Charlotte, North Carolina reported that there has been an observed increase of use of the HOV lanes since it has opened. It was reported that in November 2005, "...the HOV lane carried nearly 50 percent of the average number of persons who are traveling in a general-purpose lane in the morning peak hour, but in less than 20 percent of the number of vehicles." Additionally, the "Average daily patronage on the [Charlotte Area Transit System] CATS express routes using the I-77 HOV facility increased by 63 percent between October 2004 and 2005 ...". This reduction of vehicle miles traveled in this area was not modeled in the attainment demonstration. Having more people carpooling or using the transit system in Mecklenburg will reduce both VOC and NO_x emissions. A copy of the North Carolina Department of Transportation (NCDOT) evaluation of the I-77 HOV lane can be found at the end of this Appendix.
- Truck Stop Electrification in Rowan County. In 2006, 50 spaces at a truck stop in Rowan County were converted with Idle Aire technology. This technology provides truckers with electricity and air conditioning, allowing the truckers to turn off their engines while they rest. This results in a reduction of both NO_x and VOC emissions.
- Express Bus Route (Cabarrus/Rowan Counties). A new connecting service will be created between Rider and Salisbury Transit. This provided an express route between Kannapolis and Salisbury. Having an express route between these two cities will reduce the number of personal cars on the roadways, which in turn will reduce VOC and NO_x emissions. This new express route should be in operation between 2008 and 2010.
- Pedestrian walkways and Bikeways Projects: A number of the communities are creating walkways and bikeways in order to provide safe pathways for pedestrians and bicyclists to move about busy traffic areas. These types of projects provide safe alternatives to driving in the city.
- Idle Reduction Policies. North Carolina Department of Public Instruction has issued a policy that all school bus drivers are to refrain from idling their buses while waiting to pick up children at the school as well as when the buses are at the transportation yard. Additionally, several cities and businesses have issued idle reduction policies for their fleet vehicles. This reduces VOC and NO_x emissions as well as fine particulate matter. Some of the partners passing idle reduction policies include: Town of Concord, City of Salisbury, and Duke Power.
- Biodiesel use. A number of cities, counties and businesses have started using biodiesel for their diesel fleet. Most often B-20 is being used. B-20 will reduce VOC emissions as well as fine particulate matter. Some of the partners using biodiesel include: Gaston County Landfill, Town of Matthews, City of Monroe, Union County, NCDOT, and Duke Power.
- Diesel Retrofits. A number of cities, counties and school districts have installed Diesel Oxidation Catalysts (DOCs) or Diesel Particulate Filters (DPFs) on their diesel equipment. The vehicles that have been retrofitted include schools buses, as well as county fleet trucks for solid waste pickup. Although these types of filters are designed to remove fine particulate matter, when used with ultra low sulfur diesel fuel, NO_x and VOC emissions are also reduced. Some of the partners installing DOCs and/or DPFs include:

Cabarrus County Schools, Gaston County Schools, Iredell County Schools, Lincoln County Schools, Mecklenburg County Schools, Rowan County Schools, Salisbury Public Schools, City of Charlotte and Mecklenburg County.

F. Weight of Evidence Conclusions

The NCDAQ/SCDHEC believe that it is better to use a five-year straight average DVB in the attainment test since it will normalize the effects of meteorology on design values more so than a weighted DVB. Based on the alternative DVF calculated in this section, all of the Metrolina nonattainment area monitors are predicted to be below the 8-hour ozone NAAQS in 2009. Although three of the monitors still fall within the range for weight of evidence requirements, the monitor DVFs are lower than when a weighted DVB is used.

The air quality modeling metric analyses for the Metrolina nonattainment area demonstrate relative reductions well beyond the recommended 80% mark that is considered appropriate for concluding that a proposed strategy would meet the 8-hour ozone NAAQS. Additionally, other air quality modeling studies have found that the Metrolina area should attain the 8-hour ozone NAAQS by the prescribed attainment year.

The observed air quality trends in conjunction with further NO_x emission reductions expected in the Metrolina area strengthens the argument that the attainment demonstration is an acceptable demonstration. Finally, given the variety of additional emissions reductions that were not included in the development of this modeling exercise, but will occur throughout the surrounding areas before 2009, it is reasonable to conclude that the short lived events portrayed in the future modeled year by an extremely small number of remaining exceeding grid cells will be below the NAAQS in 2009.

The NCDAQ/SCDHEC believe that the weight of evidence provided in this section is strong evidence that the Metrolina nonattainment area will attain the 8-hour ozone NAAQS by 2009.

IV. UNMONITORED AREA ANALYSIS

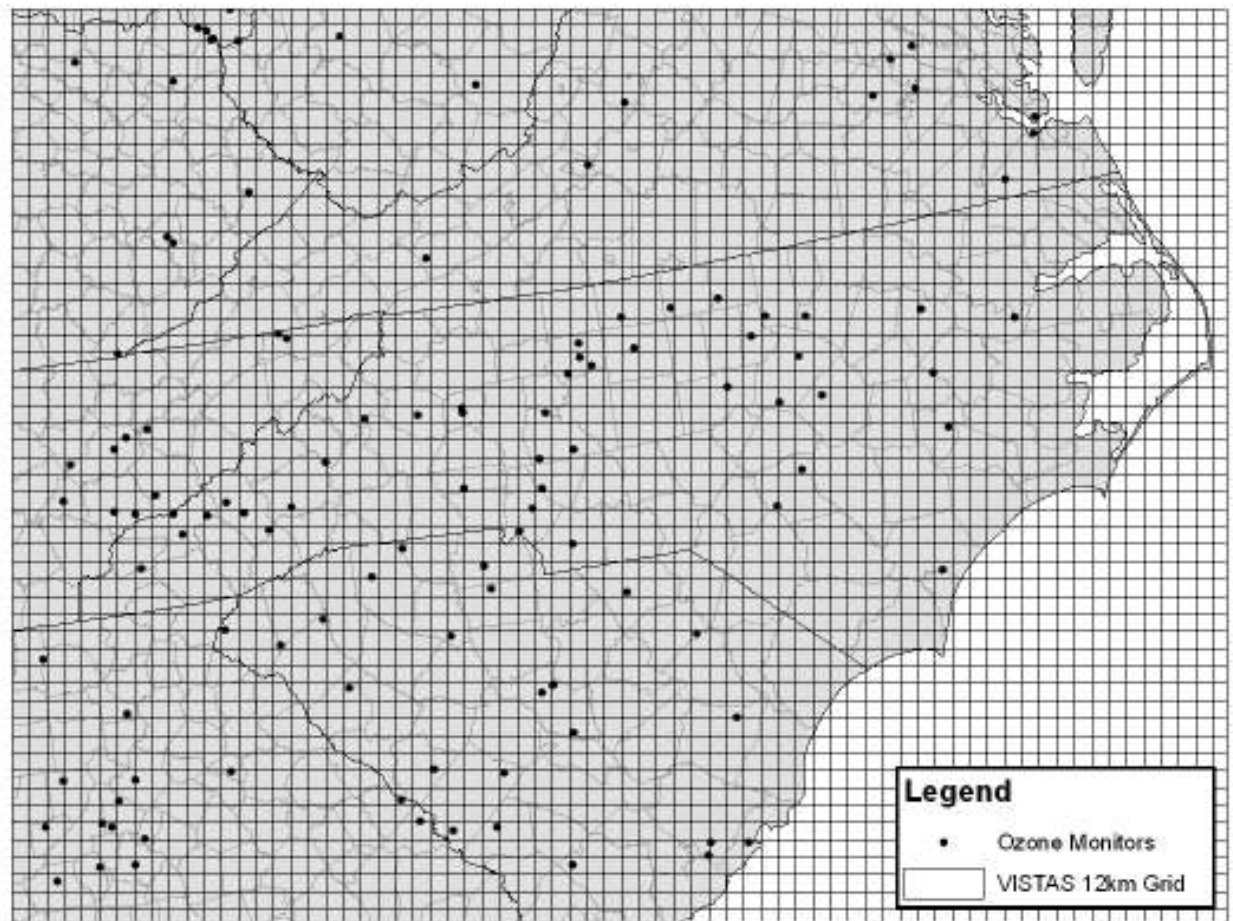
The modeled attainment test does not address future air quality at locations where there is not an ozone monitor nearby. To guard against the possibility that air quality levels could exceed the standard in areas with limited monitoring, Section 3.4 of the *Attainment Guidance* suggest that additional review is “necessary, particularly in nonattainment areas where the ozone or PM_{2.5} monitoring network just meets or minimally exceeds the size of the network required to report data to Air Quality System (AQS).” This review is intended to ensure that a control strategy leads to reductions in ozone at other locations that could have baseline (and future) design values exceeding the NAAQS were a monitor deployed there. The test is called an “unmonitored area analysis.” The purpose of the analysis is to use a combination of model output and ambient data to identify areas that might exceed the NAAQS if monitors were located there.

The NCDAQ, along with Local and Tribal Programs, currently operates a network of 41 ozone monitors. Twenty-six of these monitors were established as State and Local Air Monitoring Stations (SLAMS). These SLAMS monitors were selected based on specific monitoring objectives (background concentration, area of highest concentration, high population, source impact, transport, and rural impact) as required by the USEPA and siting scales (micro, middle, neighborhood, urban, and regional) established by the USEPA. Eight of the network monitors were further designated as National Air Monitoring Stations (NAMS) by the USEPA and have the primary objective to provide ozone data from areas of expected highest concentration and population exposure and are used to evaluate trends in national air quality. The remaining 14 monitors are Special Purpose Monitors that were established by NCDAQ to evaluate models, study ozone formation and transport, and obtain a better understanding of ozone in North Carolina. The remaining monitor is a Tribal monitor operated by the Eastern Band of Cherokee Nation.

NCDAQ believes that the density of its monitoring network relieves the necessity of applying this additional analysis. With an average of one monitor per 3,077 km², this is one of the densest statewide ozone monitoring networks in the nation. Additionally, the monitor density across the Metrolina nonattainment area is more than twice that of the statewide monitor density (on average a monitor every 1,278 km²). A map of each ozone monitor and its NCDAQ/VISTAS 12-km modeling grid is provided in Figure L-7. As can be seen by the figure, the spatial coverage of the monitors, and their resulting “near by” 3x3 arrays, covers the majority of the urban areas where ozone tends to be higher.

Despite being confident its monitoring network is robust enough to cover the state, NCDAQ has looked at preliminary results from the “beta” (draft) version of the “Modeled Attainment Test Software” (MATS) tool. The MATS tool has been developed by the USEPA to spatially interpolate data, adjust the spatial fields based on model output gradients, and multiply the fields by model calculated RRFs to complete the unmonitored area analysis. The MATS tool is currently being “beta tested” and peer reviewed, with the release of a guidance document for the tool still pending. Once the final version of the MATS tool has been released, after sufficient peer review and proper guidance documentation for the analysis of the results is provided, NCDAQ will evaluate the MATS tool output.

Figure L-7: Ozone Monitors and with Respect to the VISTAS 12 km Grid



ATTACHMENTS TO APPENDIX L

Attached to this Appendix is supporting documentation for Section III. The following documents are attached:

- NCDOT I-77 HOV evaluation report
- Spreadsheet of measures from Cabarrus/Rowan Urban Area Metropolitan Planning Organization
- Spreadsheet of National Diesel Data from the USEPA for North Carolina
- Spreadsheet of Diesel Data from the NCDAQ
- Correspondence from Centralina Council of Governments